REMARKS/ARGUMENTS

Upon entry of this amendment, claims 15-40 are pending in the application.

Drawings

In Paragraph 1 of the Office Action, the Examiner stated: "1. The proposed drawing correction filed on 2/24/03 has been disapproved because it is not in the form of a pen-and- ink sketch showing changes in red ink or with the changes otherwise highlighted. See MPEP § 608.02(v)."

Applicant points out that the drawings filed 2/24/03 were not corrections but entirely new drawings. Accordingly, pen and ink sketches are not required pursuant to MPEP§ 608.02(v).

The 35 U.S.C. § 102(b) Rejections

In Paragraph 3 of the Office Action, claims 15-20, 25 and 40 were rejected under 35 U.S.C. 102(b) as being allegedly anticipated by Genov et al (US 5,064,340).

The Examiner stated: "Genov discloses 32 is a chip gripper; 12 and 18 levers; toothed wheels and belts (Fig. 5) moves 32, 12 and 18; a plurality of shafts as Fig. 1; a drive mechanism is housed in 38; levers arranged with toothed wheels and belts provide various different angles between levers; and 32 is rigidly connected to the opposing end of the second pivoted lever by a shaft, bearings and screws (Fig. 1)." The Examiner further stated: "NOTE: Please provide reference numerals (either in parentheses next to the claimed limitation or in a table format with one column listing the claimed limitation and another column listing corresponding reference numerals in the remark section of the

response to the Office Action) to all the claimed limitations as well as support in the disclosure for better clarity. Applicants are duly reminded that a full and proper response to this Office Action that includes any amendment to the claims and specification of the application as originally filed requires that the applicant point out the support for any amendment made to the disclosure, including the claims. See 37 CFR 1.111 and MPEP 2163.06."

In response to the Examiner's request the Applicant is attaching copies of his independent claims 15 and 40 with reference numerals in parentheses.

Turning now to the Examiner's grounds for rejection, Genov et al disclose a precision arm mechanism which is useful for moving wafers, hard computer disks, and the like for processing, loading, unloading, etc. (see abstract, last sentence and column 1, lines 5 - 9). The arm has an end effector 32 having means for grasping the workpiece such as a silicon wafer or a computer hard disc (column 6, lines 40 - 41) Such an arm mechanism is also known as robot arm. The end effector 32 is a hand of a robot which can be raised and lowered, moved forward and backward and turned. Generally, the arms have z, r and θ motion in a conventional cylindrical coordinate system (column 1, lines 12 - 14). The three types of motion can be characterized as follows:

θ-motion: The complete arm structure as shown in figure 2 rotates around the axle 24.

r-motion: The end effector moves along a straight line 34 at a selected angle to the line 34 (column 8, lines 44 - 48). It is a requirement that the angle of the end effector 32 relative to the lever seating the end effector does not change during this motion.

z-motion: The complete arm structure as shown in figure 2 is raised or lowered with respect to the plane of the drawing.

In contrast to Genov et al. the apparatus of the present invention as claimed in claims 15-40 is different from Genov's precision arm mechanism in important respects.

A key feature of Applicant's invention is that Applicant's two levers are in an extended position with respect to each other when the chip gripper arrives over the first location A and second location B. This can be seen in Figure 1 wherein the first pivoted lever 10 and the second pivoted lever 12 have their axes aligned with one another in the positions indicated by dashed lines. Similarly, in Figure 5 the first pivoted lever 10' and the second pivoted lever 12' have their axes aligned with one another in the positions indicated by dashed lines.

Applicant's drive rotates the first lever 10 whereas the second lever 12 is rotated with a predetermined gear ratio n relative to the first lever 10. The angle the first lever rotates is denoted by Φ. The gear ratio n is given by the equation $n = 360°/ \Phi°$ (page 4, line 9 of Applicant's specification). In the first embodiment shown in figures 1 and 2, the angle Φ is chosen as 180°, and the gear ratio is 2. (2=360°/180°). In the second embodiment shown in figure 5, the angle Φ is chosen as 120° and the gear ratio is 3 (3=360°/120°). So when starting over location A with the two levers in an extended position with respect to each other, the two levers will arrive over location B in an extended position with respect to each other whereby the first lever will have been rotated through an angle Φ and the second lever will have been rotated through an angle of 360°.

This feature is defined in claim 15 as, "a drive mechanism for rotating said second pivoted lever in an opposite pivoting direction and with a predetermined gear ratio with respect to said first pivoted lever, the drive mechanism coupling said first and second pivoted lever such that the second pivoted lever is in an extended position with respect to

said first pivoted lever when the first pivoted lever is in said first end position or said second end position, the predetermined gear ratio, n, being defined by the formula $n=360°/\Phi$ ".

These claimed features of Applicant's invention are extremely important. As explained in Applicant's specification beginning at page 4, line 16 through page 5, line 6:

"With respect to the object of the invention, with this type of lever mechanism, of primary importance is the condition that at the end of each movement cycle the chip gripper always reaches its end position (that is to say the first or the second location) in the direction of the extended pivoted lever, that is to say the movement components at right-angles to the longitudinal direction of the levers disappear in the end positions. The inertial force of the accelerated chip gripper then acts in the direction of the extended levers and contributes in a certain way to the stabilising of the extended position. Lastly, an occasional over-swing of the first pivoted lever in the extended positions (which must be stopped at the end of its pivoting range) is of diminishing influence on the end positions of the chip gripper. Such advantageous kinematic and dynamic properties of the lever mechanism endow the mounting apparatus according to the invention with high and long-term stable positioning accuracy and at the same time allow short cycle times."

Genov et al. does not disclose these limitations of Applicant's claims. In fact, the examiner has acknowledged that Genov et al. fails to disclose a 1:3 gear ratio. (paragraph 5of the Office Action.) And, Genov does not teach or suggest any specific gear ratio at all. The robot arm of Genov et al is not limited to movements between two

specific locations A and B. Instead the robot arm of Genov et al. can perform movements between any locations within a given working space.

These differences between Genov et al. and applicant's claims are further highlighted by another patent of Genov. In an information disclosure statement, Applicant listed US 5,007,784 which is a continuation-in-part of Genov et al's US 5,064,340. US 5,007,784 contains method claims whereas US 5,064,340 contains apparatus claims. Figs. 4A to 4C of US 5,007,784 illustrate the working of the robot arm of Genov et al. These figures clearly demonstrate that the robot arm of Genov et al. does not make use of any extended positions for achieving a high positioning accuracy.

Furthermore the chip gripper is a device well known in the art which is designed to pick and hold semiconductor chips; it is not constructed for holding a wafer and like articles like the robot arm of Genov.

Applicant therefore respectfully traverses the U.S.C. §102(b) rejection of claims 15-20, 25 and 40 and submits that claims 15-20, 25 and 40 are allowable in view of the cited prior art.

The 35 U.S.C. § 103(a) Rejections

In the Office Action, claims 21-24 and 26-39 were rejected under 35 U.S.C. 103(a) as being unpatentable over Genov et al (US 5,064,340) in view of Parker (US 5,934,147).

The Examiner stated: "At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to provide a gear

ratio of 1: 3 because Applicant has not disclosed that such gear ratio provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with the gear and toothed belt system as taught by Genov because the outcome of the apparatus is the same." The Examiner further stated: "NOTE: Please provide reference numerals (either in parentheses next to the claimed limitation or in a table format with one column listing the claimed limitation and another column listing corresponding reference numerals in the remark section of the response to the Office Action) to all the claimed limitations as well as support in the disclosure for better clarity. Applicants are duly reminded that a full and proper response to this Office Action that includes any amendment to the claims and specification of the application as originally filed requires that the applicant point out the support for any amendment made to the disclosure, including the claims. See 37 CFR 1.111 and MPEP 2163.06."

With regard to the gear ratio n, Applicant has explained above the meaning and importance of the equation $n = 360°/ \Phi$. It has been explained that the second pivoted lever always turns for 360° when the lever mechanism turns from the first location to the second location, i.e. it makes a full rotation on the axis of the shaft at the end of the first pivoted lever. The rotation angle of the first pivoted lever can be chosen and it is generally defined as Φ With this in mind the gear ratio n can be calculated by means of the cited equation as $n = 360°/ / \Phi$. The gear ratio is therefore not a mere matter of choice but the gear ratio has to be calculated according to a strict rule which rule is not known from the prior art as the prior

art does not teach to use extended positions of two levers to achieve a high positioning accuracy.

Accordingly, it can be seen that Applicant's claimed gear ratio provides significant advantages and is used for a particular purpose.

Applicant respectfully traverses the U.S.C. §103(a) rejection of claims 21-24 and 26-39 and submits that these claims are not obvious and allowable in view of the cited prior art.

Request for Entry of Amendment

Entry of this Amendment will place the application in better condition for allowance, or at the least, narrow any issues for an appeal. Accordingly, entry of this Amendment is appropriate and is respectfully requested.

Request for Allowance

As each of the Examiner's rejections have been addressed herein, early favourable consideration of this Amendment is earnestly solicited and Applicant requests that the Examiner enter this amendment and pass claims 15-40 to issue.

If, in the opinion of the Examiner, an interview would expedite the prosecution of this application, the Examiner is invited to call the undersigned attorney at the number indicated below. The Commissioner is hereby authorized to charge any additional fees or

credit any overpayment to Deposit Account No. 50-1698.

Respectfully submitted,

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Attachment

15. (Currently Amended) An apparatus used as a component of a die bonder for placing a semiconductor chip on a substrate, comprising:

a first pivoted lever (10) seated at one end on a first shaft (4), said first shaft mounted equidistantly between a first location (A) and a second location (B);

a drive (1,2) coupled to said first shaft for pivoting said first pivoted lever in alternating pivoting directions through an angle of pivoting, Φ, between a first end position in which said first pivoted lever (10) is directed toward said first location (A) and a second end position in which said first pivoted lever (10) is directed toward said second location (B);

a second pivoted lever (12) mounted by means of a second shaft (14) located at another end of said first pivoted lever (10), a sum of lengths of said first and second pivoted levers equalling a distance from said first shaft (4) to said first location (A) or said second location (B), said first and second pivoted levers pivoting in horizontal planes;

a drive mechanism (2, 3, 4, 5, 6, 7) for rotating said second pivoted lever (12) in an opposite pivoting direction and with a predetermined gear ratio with respect to said first pivoted lever (10), the drive mechanism coupling said first and second pivoted lever such that the second pivoted lever (12) is in an extended position with respect to said first pivoted lever (10) when the first pivoted lever (10) is in said first end position or said second end position, the predetermined gear ratio, n, being defined by the formula $n=360^{\circ}/\Phi$; and

a semiconductor chip gripper (20) seated at an opposing end of said second pivoted lever (12).

40. (Currently Amended) An apparatus for placing a semiconductor chip on a major surface of a substrate, comprising:

a first pivoted lever (10) seated at one end on a first shaft (4), said first shaft mounted equidistantly between a first location (A) and a second location (B);

a drive (1,2) coupled to said first shaft for pivoting said first pivoted lever (10) in alternating pivoting directions through an angle of pivoting, Φ, between a first end position in which said first pivoted lever (10) is directed toward said first location and a second end position in which said first pivoted lever (10) is directed toward said second location;

a second pivoted lever (12) mounted by means of a second shaft located at another end of said first pivoted lever, a sum of lengths of said first and second pivoted levers equalling a distance from said first shaft to said first location or said second location, said first and second pivoted levers configured to sweep through a plane parallel to the major surface of the substrate;

a drive mechanism (2, 3, 4, 5, 6, 7) for rotating said second pivoted lever (12) in an opposite pivoting direction and with a predetermined gear ratio with respect to said first pivoted lever, the predetermined gear ratio, n, being defined by the formula $n=360^{\circ}/\Phi$, the drive mechanism coupling said first and second pivoted lever (12) such that the second pivoted lever (12) is in an extended position with respect to said first pivoted

lever when the first pivoted lever is in either said first end position or said second end position; and

a semiconductor chip gripper (20) seated at an opposing end of said second pivoted lever (12).